NPC proposal abstract

The NOvA experiment is a long-baseline neutrino oscillation experiment designed to measure the rate of electron neutrinos appearance in a muon neutrino beam. The precision of the oscillation analysis largely depends upon the systematic precision of neutrino energy measurement, in particular, the precision of hadronic energy where NOvA has been observing a discrepancy between data and Monte Carlo simulation. There are two broad factors the neutrino energy measurement depends on: 1) Accurate simulation of the detector response to the charged and neutral hadrons, photons, and 2) Modeling of the neutrino-nucleus cross-sections and the nuclear effects, including both initial- and final-state interactions.

My proposal focuses on two topics related to these two aspects of the neutrino energy problem. The first is on the NOvA test-beam effort. A smaller version of NOvA detector will be exposed to charged particles with known momentum at the Fermilab test-beam facility. It provides precise measurements of the absolute detector response to charged particles. I will contribute to the data-aquisation system, installation and commissioning of this test-beam detector. The second topic is the reconstruction and measurement of neutrino induced pion-production in NOvA near detector, which is the most important neutrino interaction channel in NOvA's energy range, and also provide an constraint on the nuclear effect, important to the neutrino energy scale.